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(19) (CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Aid for Crossover Skating Technique

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(71) Same as inventor

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ABSTRACT OF THE DISCLOSURE

An apparatus for learning a skating technique on a skating surface, the apparatus including a stationary support disposed along a first axis that intersects the skating surface, the stationary support having a pivot mechanism; and a first rotatable support capable of being grasped by a skater to support the skater, the first rotatable support having a proximal end, the proximal end attached to the stationary support at the pivot for rotation of the first rotatable support about the first axis.

AID FOR CROSS-OVER SKATING TECHNIQUE**BACKGROUND OF THE INVENTION**

The present invention generally relates to an exercise device for use by a person while training along an arcuate path. The present
5 invention also relates to an exercise device for a person wearing skates that allows the person to train and exercise at a proper height and orientation and in a balanced stance during either static or dynamic training or exercising activities.

Persons who wear skates, such as ice skates and roller skates,
10 and persons who wear skis, such as water skis and snow skis, have been able to train and exercise using a variety of training aids and exercise devices. These aids and devices typically permit the person to learn correct body orientation and balance and also help develop muscle groups required for the skating or skiing activity.

15 One example of an existing training apparatus is disclosed in U.S. Patent No. 4,340,214 to Schutzer. The Schutzer device is similar to the slideboard which is well known among serious skaters. The Schutzer device provides a lateral, inclined track which allows side-to-side motion and stretching of the feet and legs. An upright support at the center of the
20 Schutzer device helps maintain the user's body in the correct skating position.

U.S. Patent No. 4,915,373 to Walker discloses an exercise machine for developing ice skating skills. The Walker machine includes a bicycle-type saddle in the center for seating the user in a crouching position.
25 Foot stirrups that are intended to approximate the skating motion ride in two triangular tracks on either side of the saddle. A portion of each track is designated as a power section and is provided with means for creating drag on the stirrups as the stirrups pass through the power section. The drag

created by passage of the stirrups through the power section requires greater exertion of force by the user to move the stirrups through the power section.

U.S. Patent No. 5,284,460 to Miller discloses a device that is similar to the Walker and Schutzer devices. The Miller device is essentially
5 a stationary training device with a central support that is located behind the skater. The central support allows the skater's trunk to remain in a fixed location in relation to the central support while allowing the skater to freely move his or her feet in a side-to-side skating motion.

U.S. Patent No. 5,385,520 to Lepine discloses a treadmill for
10 practicing ice skating techniques while permitting close range observation of the skating technique in a controlled off-ice environment. The treadmill includes a motorized, rotating, endless belt that offers the skater a stationary platform for developing skating technique. The artificial environment of the Lepine device assists the user in developing either forward or backward
15 skating technique, but does not address techniques for skating along an arcuate path. Additionally, the artificial environment does not allow the skater to practice skating techniques on a real-live skating surface, such as ice or land.

The act of wearing a pair of skates or skis produces the
20 advantage of reduced friction with the skating or skiing surface so that the person wearing the skates or skis can glide across the surface. The reduced friction permits skaters and skiers to use less energy in producing and maintaining the momentum needed to glide across the skating or skiing surface.

25 The inherent difficulty with skating and skiing is that the reduced friction often accelerates unbalanced movements when the person's center of gravity is not balanced directly over the person's feet and helps cause the person to fall. To avoid unbalanced movements, the person must quickly and correctly move the feet, while maintaining proper body stance,

to counteract the forces causing the unbalanced movements. Vulnerability to falling is especially pronounced in persons who are first learning how to ski or skate. Also, more advanced skiing and skating techniques that require shifting the body's center of gravity to a position that is not directly over the feet often produces a loss of balance if the center of gravity is not quickly and correctly shifted in a coordinated movement.

These problems relating to adequate control of the body's center of gravity exist when the skater or skier is learning to move forward and are even more pronounced for persons who are learning to move backward. Also, skaters and skiers who are learning to turn, corner, or otherwise move along an arcuate path often experience problems relating to adequate control of the body's center of gravity.

Some of the forces that act on a person who is skating or skiing along an arcuate path are centrifugal in nature. The centrifugal forces acting on the person are applied to the person's center of gravity and produce a moment about the point where the skate blade or wheel contacts the skating surface or where the ski contacts the skiing surface.

This moment produces a rotational acceleration of the individual that may force the skate blade, skate wheel, or ski to deviate from the arcuate path and may also cause the person to lose his or her balance and fall. In order to continue traveling along the arcuate path without falling, the individual must counteract the centrifugal force by applying a counterbalancing force to the skate blade, skate wheel, or ski. The counterbalancing force should be oriented directly to the center point that defines the arcuate path or arcuate path segment.

There is a need for a device that allows skaters and skiers to learn and perfect proper body orientation and positioning and proper techniques for applying forces that counterbalance centrifugal forces encountered when skating or skiing along an arcuate path. No existing

device, including the aforementioned Schutzer, Walker, Miller, and Lepine devices, permits persons of all experience levels -- from beginner to expert -
- to train in a dynamic environment while learning and perfecting the proper body orientation, positioning, and force application needed when skating or
5 skiing along an arcuate path.

One make-shift technique for teaching arcuate path travel does exist. This technique involves a trainer who stands at the center of a radial path. The trainer holds onto one end of a hockey stick or a ski pole and stands at the center of a radial path. The skater or skier holds onto the
10 other end of the stick or pole and skates or skis about the trainer along the radial path. This technique is of limited usefulness because the trainer standing at the center of the radial path rotates with the skater or skier and quickly becomes tired, dizzy, and disoriented.

A need also exists for a device that allows a stationary skater
15 or skier to learn proper body orientation and positioning for applying correct counterbalancing force. Such a device would permit a trainer to demonstrate discreet elements of the proper skating technique and to observe and modify particular aspects of the person's skating or skiing technique in a controlled environment.

SUMMARY OF THE INVENTION

The present invention includes an apparatus for learning a skating technique on a skating surface. The apparatus includes a stationary support having a pivot mechanism. The stationary support is disposed along
5 a first axis that intersects the skating surface. The apparatus also includes a first rotatable support having a proximal end. The proximal end of the first rotatable support is attached to the stationary support at the pivot mechanism for rotation of the first rotatable support about the first axis. The first rotatable support is capable of being grasped by a skater to support
10 the skater. The present invention also includes a skate training apparatus usable on a skating surface. The present invention further includes a method usable by a person wearing skates for practicing a cross-over skating technique on a skating surface.

BRIEF DESCRIPTION OF THE DRAWINGS

15 Figure 1 is a perspective view of a training apparatus of the present invention.

Figure 2 is a perspective view of an adjustable body support device of the training apparatus of the present invention.

20 Figure 3 is a partially exploded perspective view of the body support device depicted in Figure 2.

Figure 4 is a perspective view of another training apparatus of the present invention.

25 Figure 5 is a top plan view of the training apparatus depicted in Figure 4.

Figure 6 is a perspective view of another training apparatus of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A training apparatus of the present invention is generally indicated at 10 in Figure 1. The apparatus 10 includes a pivot mechanism, such as a bushing, a bearing, or a swivel 12, that is positioned along an axis
5 A. The axis A intersects a surface 14. In addition to the swivel 12, the apparatus 10 also includes a rotatable support 16 that is attached to the swivel 12 for rotation about axis A. The rotatable support 16 is capable of being grasped by a skater (not shown) to support the skater. The apparatus 10 of the present invention also includes a stationary support, such as a
10 center support 18, that secures the swivel 12 and the rotatable support 16 in working relationship with the surface 14.

The training apparatus 10 of the present invention permits a person who is wearing skates, such as ice skates or roller skates, or a person who is wearing skis, such as water skis or snow skis, to train and exercise in
15 a balanced stance at a correct height during either static or dynamic training or exercising activities. Figure skates, hockey skates, and speed skates are some examples of the types of ice skates people can wear while using the apparatus 10. Some examples of roller skates people can wear while using the apparatus 10 include in-line skates and skates having two or more wheel
20 tracks. The training apparatus 10 of the present invention also permits a person, such as an amputee or a person with a leg disability, who is wearing a single skate or ski to train in a balanced stance during either static or dynamic training or exercising activities.

The training apparatus 10 is capable of fully supporting the
25 skater or skier during both static and dynamic training activities. The apparatus 10 also helps the skater or skier to establish and maintain proper body position and orientation for balancing and efficiently applying skating or skiing force while skating or skiing. The training apparatus 10 is especially beneficial for skaters and skiers who are learning or practicing

turning, cornering, or otherwise moving along an arcuate path, since arcuate maneuvers frequently cause problems relating to adequate control of the body's center of gravity.

5 The swivel 12 of the training apparatus 10 includes an outer case 20 and a bearing assembly (not shown) that is aligned along axis A and is contained within the outer case 20. The bearing assembly includes a bearing (not shown) that is capable of handling radial loads that are directed perpendicular to axis A. Preferably, the bearing is a radial/thrust type bearing, such as a deep-groove ball bearing or a ball thrust bearing, that is
10 capable of handling both radial loads that are directed perpendicular to axis A and also thrust loads that are directed parallel to axis A. The swivel 12 permits rotation of the rotatable support 16 about axis A.

The rotatable support 16 includes a vertical support portion 30 with upper and lower ends 32 and 34. The lower end 34 of the vertical
15 support 30 is fixedly attached to a top side 36 of the outer case 20. The vertical support portion 30 is preferably aligned along axis A. The rotatable support 16 also includes a boom, such as a support arm 40 with a proximal end 42 and a distal end 44. The support arm 40 is attached at the proximal end 42 to the upper end 32 of the vertical support portion 30. The support
20 arm 40 is preferably perpendicular to axis A and is preferably substantially parallel to the surface 14 so that the distal end 44 of the support arm 40 remains at substantially the same height H_1 above the surface 14 as the rotatable support 16 pivots about axis A.

The rotatable support 16 preferably also includes an angular
25 brace 46 with ends 48. One of the ends 48 is attached to the vertical support 30 proximate the lower end 34 and another of the ends 38 is attached to the support arm 40 between the proximal end 42 and the distal end 44. The brace 46 stiffens and strengthens the rotatable support 16.

Components of the rotatable support 16, including the vertical support portion 30, the support arm 40 and the angular brace 46, may be made of any suitable high strength material, including metal and high strength plastic. Preferably, the vertical support portion 30, the support arm 40, and the angular brace 46 are made of aluminum tubing that is rectangular in cross section. The vertical support portion 30, the support arm 40, and the angular brace 46 may be fixedly attached to each other, such as by welding, or may be releasably attached to each other using conventional techniques, such as cotter pin/bore attachments.

The training apparatus 10 of the present invention also includes the center support 18 that holds the swivel 12 in position along axis A and also maintains the position of the rotatable support 16 with respect to the surface 14. The center support 18 includes a base 60, such as a base plate 62, with an attached boss 63, and also includes an extension 64 that slidably fits over the boss 63. The extension 64 and the boss 63 may be fixed together or may be releasably attached, such as by inserting a cotter pin or other fastening mechanism (not shown) through a hole 65 bored through the extension 64 and a hole (not shown) bored through the boss 63, with the hole through the boss 63 being aligned with the hole 65. The center support 18 substantially, and preferably fully, prevents movement of axis A with respect to the surface 14. To accomplish this, the base 60 may be fixedly attached to the surface 14. Alternatively, the base 60 may be provided with adequate dimensions, adequate weight, or an adequate combination of dimensions and weight to counterbalance any forces that are applied to the rotatable support 16 during use of the apparatus 10.

The center support 18 also includes a cylindrical tube or rod 68 (shown in phantom in Figure 1) that is oriented along axis A. One end of the cylindrical tube 68 fits within the swivel 12 and another end of the cylindrical tube 68 fits within the extension 64. The bearing located within

the swivel 12 engages and rides along the outer radial surface of the cylindrical tube 68. The tube 68 preferably includes a mechanism, such as a shoulder (not shown) at an upper end of the tube 68, that prevents the tube 68 from moving longitudinally (along A axis) with respect to the bearing.

The end of the cylindrical tube 68 that fits within the extension 64 is fixed within the extension 64 to prevent rotation of the cylindrical tube 68 with respect to axis A and the support 18. The cylindrical tube 68 may be locked in the extension 64 to prevent rotation of the cylindrical tube 68 using any conventual technique. One such technique entails insertion of a cotter pin or other fastening mechanism (not shown) through a hole 66 bored through the extension 64 and a hole (not shown) bored through the cylindrical tube 68, with the hole in the tube 68 being aligned with the hole 66. Preferably, the pin or fastening means extends all the way through both the extension 64 and the cylindrical tube 68.

Components of the center support 18, including the base 60, such as the base plate 62, the boss 63, the extension 64, and the cylindrical tube 68, may be made of any suitable high strength material, including metal and high strength plastic. Preferably, the base 60 is made of aluminum plate, the boss 63 is made of cast aluminum, the extension 64 is made of aluminum tubing of rectangular cross section, and the cylindrical tube 68 is made of aluminum tubing of cylindrical cross section.

Axis A is preferably maintained perpendicular to the surface 14 so that the distance between components of the rotatable support 16 and the surface 14 stays approximately the same as the support 16 rotates about axis A. The surface 14 may be formed of any suitable material, including ski-able or skate-able materials such as concrete, asphalt, wood, ice, simulated ice, snow, and water. The material that forms the surface 14 proximate the base 60 may be different from the material that forms the

surface 14 proximate an arcuate path B that a skater grasping the support 16 defines while rotating about axis A. As an example, the surface 14 proximate the base 60 could be made from concrete, while the surface 14 proximate the arcuate path B could be simulated ice.

5 All subsequent comments about the training apparatus 10 and variations of the training apparatus 10 are stated in terms of skating and skaters, though it is to be understood that subsequent comments are equally applicable to skiing and skiers, unless otherwise specified. All subsequent comments also apply to skaters or skiers wearing only a single skate or ski.

10 The skater may grasp the rotatable support 16, such as proximate the distal end 44 of the support arm 40, while positioning the skates to place the skater's center of gravity in an offset condition -- that is -- not positioned directly over the skates. Absent grasping the rotatable support 16, the skater's offset center of gravity would sometimes cause the
15 skater to fall. However, since the skater is grasping the rotatable support 16, the skater, while remaining stationary, is able to stay upright on the skates and practice proper body orientation and force application for counterbalancing the offset center of gravity.

The training apparatus 10 also permits skaters to learn proper
20 body orientation and force application for arcuate travel while actually skating. The skater who grasps the support 16 defines the arcuate path B, typically a circular path, while rotating about axis A. The skater may use the apparatus 10 while learning to skate in either a forward or backward direction (not shown) along the arcuate path B. As with the above
25 description of static training, the person grasps the rotatable support 16, such as proximate the distal end 44 of the support arm 40, while initially placing the body in an out of balance orientation with the center of gravity offset from the skates. As the person travels along the arcuate path, the person can learn the body positions, body orientation, balance, and force application

that are required at different rotational speeds to rebalance the center of gravity and counteract centrifugal forces generated by travel along the arcuate path.

5 The training apparatus 10 has been found to be particularly
useful for teaching the cross-over skating technique to ice skaters, such as
hockey, figure, and speed skaters and to roller skaters, such as in-line
skaters. Cross-over skating is a technique for maximizing speed, control, and
power application, for skaters traveling along an arcuate route, such as along
10 the arcuate path B or the circular path about axis A. Typically, control is
maximized and speed loss is minimized when the skater maximizes the time
when the skates are in contact with the skating surface. The cross-over
skating technique teaches the skater to equally and effectively use both skate
blades while traveling either forward or backward in either a left arcuate or
right arcuate direction along the arcuate path B. Proper use of the cross-
15 over technique will increase the skater's speed. Proper use of the cross-over
technique will also increase leg muscle efficiency at counterbalancing
centrifugal forces that tend to cause deviation from the arcuate path.

 The cross-over technique is basically a method for crossing the
skates in front of each other during the skating exercise. For a skater
20 proceeding forward in a left arcuate direction and starting with the right
skate at the end of a power stroke, the right skate (the "resting" skate) is
moved in a forward direction several inches ahead of the left skate (the
"power" skate). The power skate (the left skate) is concurrently moved
outward away from the center point that defines the arcuate path B to
25 counterbalance centrifugal force acting on the skater and propel the skater
forward along the arcuate path B.

 While the resting skate (the right skate) is being moved ahead
of the power skate (the left skate), the resting skate is also moved toward
the center (ie: toward axis A) of the arcuate or circular path, as compared

to the power skate. Depending upon the skater's speed and desired acceleration or deceleration, the resting skate may be moved from several inches to as much as a few feet inward toward the center of the arcuate or circular path, as compared to power skate. As the right skate (resting skate) reaches the forward, inside position, and the left skate (power skate) reaches the rear, outside position, the right skate becomes the power skate that is used to push outward for powering the forward, arcuate motion and the left skate becomes the resting skate that is moved forward in preparation for becoming the next power skate. This cycle is repeated in alternating, repetitive sequence by the left and right skates to move the skater along the arcuate path quickly and with maximum utilization of the skater's energy.

The cross-over technique has been found to be superior to other skating techniques, such as those where the left and right skates do not cross in front and toward the inside of each other, for maximizing speed, control, and power application while turning, cornering, or otherwise traveling along an arcuate route. It has also been found that the training apparatus 10 of the present invention is well adapted to teaching proper cross-over skating technique. As with other techniques for moving along the arcuate path, centrifugal forces increasingly act on the body at faster speeds and as the arcuate path tightens.

Without added support, such as that provided by the apparatus 10, it is not possible for a freestanding skater, who is either remaining stationary or traveling at low speeds along an arcuate path, to learn the cross-over skating technique for counterbalancing centrifugal forces present at higher speeds. This impossibility arises because the body positioning and orientation and muscle application needed at faster speeds would force the body's center of gravity out of balance at lower speeds or while remaining stationary and would allow the body to fall.

However, when the skater grasps the support 16, while learning the cross-over skating technique for countering centrifugal forces present at

higher speeds, the skater does not fall, even at lower speeds or while remaining stationary, because the support 16 fully supports the skater, despite the skater's offset center of gravity. Thus, the skater may use the apparatus 10, while remaining stationary or while traveling at low speeds, to
5 learn proper body positioning and orientation and muscle application for counterbalancing centrifugal forces present at higher speeds, without falling down. Of course, the skater may also use the apparatus 10, while traveling at low speeds, to learn proper body positioning and orientation and muscle application for counterbalancing centrifugal forces present at higher speeds,
10 without falling down.

The rotational support 16 may optionally include an adjustable body support device 70. The body support device 70 includes a guide, such as a bushing, collar, or sleeve 72; a support arm structure 76; and a riser portion 82. The sleeve 72 is aligned along an axis C that is preferably
15 substantially parallel to axis A. The support arm structure 76 includes an arm 77 that is fixedly attached to a flange 78. The flange 78 includes a plurality of pairs of bores 80a, 80b, 80c, as best depicted in Figure 3, that extend through both faces of the flange 78. The flange 78 also includes a bore (not shown) that extends along the central axis of the flange 78 through
20 the faces of the flange 78.

The riser portion 82 includes a shaft 83 with a bottom end 84 and a flange 85 that is normally held in place against the bottom end 84 of the shaft 83. The bottom end 84 of the shaft 83 includes a threaded bore (not shown) that is substantially aligned with the longitudinal axis of the
25 shaft 83. The shaft 83 also includes a plurality of bores 88 that are distributed along the shaft 83 and extend through the shaft 83, via the longitudinal axis of the shaft 83.

The flange 85 includes a pair of bores 86 that extend through both faces of the flange 85. The bores 86 are capable of being placed in
30 alignment with the bores 80a, the bores 80b, or the bores 80c, depending

upon the rotational orientation of flange 78 relative to the flange 85. The flange 85 also includes a bore (not shown) that extends along the central axis of the flange 85 through the faces of the flange 85. The bore that extends along the central axis of the flange 78 and the bore that extends along the central axis of the flange 85 preferably have the same diameter.

The shaft 83 is slidably received within the sleeve 72. The sleeve 72 includes a pair of bores 89 (only one of the bores 89 is visible at a time in the Figures) that are in alignment with each other. The shaft 83 may be fixed relative to the sleeve 72 by aligning the bores 89 of the sleeve 72 with any one of the bores 88 of the shaft 83 and then inserting a fastening mechanism, such as a cotter pin (not shown), through the bores 89 and the bore 88. Also, a height H_2 of the support arm structure 76 above the surface 14 may be readily adjusted by removing the pin from the bores 88, 89; aligning a different one of the bores 88 with the bores 89; and replacing the pin through the bores 89 and the different bore 88. The height H_2 is preferably adjustable in a suitable range, such as from about two feet to about four feet, so that the support arm structure 76 may be adjusted to be approximately at waist height for both young and older persons who use the training apparatus 10 for arcuate path training or exercising.

The support arm structure 76 may be attached to the riser portion 82 by aligning the bore that extends along the central axis of the flange 78, the bore that extends along the central axis of the flange 85, and the threaded bore that extends into the bottom end 84 of the shaft 83. Next, a threaded stud (not shown), with a cap end and a smooth shoulder that is located between the cap end and the threads, is inserted through the central bores of the flanges 78, 85 and is threaded into the threaded bore in the bottom end 84 of the shaft 83. The combined width, face to face, of the flanges 78, 85 is equal to the length of the smooth shoulder, and the

diameters of the smooth shoulder and the flange 78, 85 central bores are approximately the same.

Before the threaded stud is tightened to secure the flange 85 against the end 84 of the shaft 83 and to secure the flange 78 against the flange 85, one of the pairs of bores 80a, 80b, or 80c of the flange 78 should be aligned with the bores 86 of the flange 85. A pin, such as a cotter pin (not shown), may then be inserted through the bores 86 and the aligned pair of bores 80a, 80b, or 80c. The angular position of the arm 77 with respect to the support arm 40 may be adjusted by partially loosening the threaded stud; removing the cotter pin; placing the bores 86 in alignment with a different pair of the bores 80a, 80b, and 80c; replacing the pin through the bores 89 and the different pair of bores 80a, 80b, and 80c; and re-tightening the threaded stud.

Changing the angular position of the arm 77 with respect to the support arm 40 permits the skater to practice or learn new body positions for counterbalancing centrifugal force, where the skater's shoulders define a line (not shown) that points either in front of, toward, or behind axis A. It has been found that the optimum shoulder positions for balancing during arcuate travel and efficiently applying skate force that counterbalances centrifugal force are those where the skater's shoulders, and thus the arm 77, define a line (not shown) that points behind axis A. Thus, the angular orientation of arm 77 relative to the arm 40 depicted in Figure 1 is a preferred orientation for shoulder positioning for the skater who is proceeding along the arcuate path B in the direction of arrow b.

Returning to Figure 3, components of the adjustable body support device 70, including the sleeve 72; the arm 77 and the flange 78 of the support arm structure 76; and the shaft 83 and flange 85 of the riser portion 82, may be made of any suitable high strength material, including metal and high strength plastic. The components of the adjustable body support device 70 are preferably made of aluminum.

The adjustable body support device 70 may be either fixedly or adjustably attached to the support arm 40 of Figure 1. For example, the distal end 44 of the support arm 40 may be weldably attached to the sleeve 72. Alternatively, as best depicted in Figure 3, the adjustable body support device 70 may be fixedly attached to an insert structure 90 that slideably fits inside the tubing of the support arm 40. The insert structure 90 may include a cylindrical rod 91 that is welded at one end to the sleeve 72. A tubular insert 92 with opposing end holes 94 may then be slidably positioned on the rod 91, by sliding the holes 94 over the rod 91, to form the insert structure 90. (Only one of the holes 94 is shown in Figure 3).

The tubular insert 92 has the same cross sectional shape as the support arm 40, but has slightly smaller dimensions than the interior of the arm 40. This permits the tubular insert 92 to be slidably received within the arm 40. The tubular insert 92 includes a shoulder 96 that bears against the end of the support arm 40 and prevents the tubular insert 92 from sliding completely into the arm 40. Holes 99 bored through the distal end 44 of the support arm 40 may be aligned with holes 98 bored through the insert structure 90. After the holes 98, 99 are aligned, a pin (not shown) may be placed through the holes 99 and the holes 98 to fix the insert structure 90 within the arm 40 and to fix a distance D between the body support device 70 and axis A. The distance D between axis A and the body support device 70 may be made adjustable by lengthening the insert structure 90 and by including more holes 98 (not shown) along the length of the insert structure 90. The distance D could then be adjusted by aligning the holes 99 with holes 98 that are different from those depicted in Figure 3, and by inserting the pin through the newly aligned holes 98, 99.

When the body support device 70 is included, the skater grasps the arm 77 of the body support device 70, rather than the distal end 44 of the support arm 40. By doing this, the skater is able to adjust the skater's

angular position relative to the arm 40 by placing the bores 86 of the flange 85 in alignment with different pairs of the holes 80a, 80b, or 80c of the flange 78. Also, the skater is able to change the height H_2 of the support arm 76 above the surface 14 as already described. These adjustments of the height H_2 and the angular position of the arm 77 are especially useful when learning adjustments to body position and balance and variations in the cross-over technique that are needed for travel along arcuate paths with different radiuses from that of arcuate path B and for different speeds of travel along the various arcuate paths. The ability to change the distance D between the body support device 70 and axis A permits the user to change the centrifugal forces experienced at a particular arcuate path speed and also permits travel on different arcuate paths with different radiuses.

In a preferred embodiment, the training apparatus of the present invention may alternatively be configured like a training apparatus that is depicted at 110 in Figure 4. The training apparatus 110, like the apparatus 10, includes the swivel 12, the support arm 40, and the base 60. However, the apparatus 110 includes a rotatable support 116, in place of the rotatable support 16 that is included in the apparatus 10. The rotatable support 116 includes the support arm 40 and the adjustable body support device 70. The adjustable body support device 70 may be either fixedly or adjustably attached to the support arm 40, as already discussed.

The proximal end 42 of the support arm 40 may be fixedly attached to the outer case of the swivel 12, such as by welding. Alternatively, the swivel 12 may include a stub 144 that is fixedly attached to the swivel 12. The stub 144 is adapted to slidably fit within the proximal end 42 of the support arm 40. The stub 144 includes a bore (not shown) that aligns with holes 146 extending through the support arm 40 so that a pin (not shown) may be inserted through the holes 146 and the bore of the stub 144 to releasably attach the support arm 40 to the stub 144.

The rotatable support 116 also includes braces 146a, 146b, braces 148a, 148b, and cross brace 150. One end of each of the braces 146a, 146b is attached to the support arm 40, at the proximal end 42, so that the attached ends of the braces 146a, 146b are adjacent to each other.

5 Preferably, the ends of the braces 146a, 146b are releasably attached to the support arm 40 using a suitable releasable attachment mechanism. One suitable releasable attachment mechanism is an attachment device 152 that includes a tongue component 154 and a flap component 156. One tongue component 154 is attached to one end of each brace 146a, 146b and a pair of the flap components 156 are attached to the support arm 40. The tongue (not shown) of each tongue component 154 is inserted between parallel flaps (not shown) of each respective flap component 156 and is held in place in the flap component 156 by a pin inserted through aligned bores (not shown) extending through the parallel flaps and the tongue.

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15 Another end of the brace 146a is attached to an end of the cross brace 150, and another end of the brace 146b is attached to an opposing end of the cross brace 150. The ends of the braces 146a, 146b that are attached to the ends of the cross brace 150 are preferably releasably attached to the cross brace 150 using the device 152 that includes the tongue component 154 and the flap component 156.

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Also, one end of each of the braces 148a, 148b is attached to the distal end 44 of the arm support 40, so that the attached ends of the braces 148a, 148b are adjacent to each other. Other ends of the braces 148a, 148b are attached to respective opposing ends of the cross brace 150, adjacent to where the braces 146a, 146b are attached to the cross brace 150.

25 Preferably, the ends of the braces 148a, 148b are releasably attached to both the support arm 40 and the cross brace 150, using the attachment device 152 that includes the tongue component 154 and the flap component 156.

The rotational support 116 also includes a pair of wheels 158 that are rotatably attached to respective ends of the cross brace 150, opposite the points where the braces 146a, 148a and the braces 146b, 148b are attached to the cross brace 150. The wheels 158 permit the rotational support 116 to roll along the surface 14 about axis A as the person grasps the support arm 76 to move either forward or backward along the arcuate path B about axis A. The rotational support 116 that includes the wheels 158 permits the support arm 40 to be longer in the apparatus 110, as compared to the apparatus 10, so that arcuate paths with longer radii may be utilized for training.

The rotational support 116 may also include an extension arm (not shown) that is attached to the swivel 12, such as with the stub 144, and to the proximal end 42 of the support arm 40. One suitable technique for connecting the extension arm and the support arm 40 is a flanged connection, although other connection techniques could be used. No other additions, such as additional braces or supports would be needed to incorporate the extension arm into the support 116. Incorporation of the extension into the training apparatus 110 is one way of increasing the radius of arcuate path B.

The base 60 supports the swivel 12 and the rotational support 116 via the cylindrical tube 68 (not shown in Figure 4) that extends into both the bearing (not shown) of swivel 12 and the extension 64. The extension 64 may consist of a length of aluminum tubing that may be rectangular or circular in cross section, but is preferably square in cross section. The extension 64 is of appropriate length, such as from about two to about four feet, so that the support arm 76 may be adjusted to be approximately at waist height for both young and older persons who use the training apparatus 110 for arcuate path training or exercising.

The components of the training apparatus 110, including the bearing and outer case 20 of the swivel 12; the arm 40, braces 146a, 146b, 148a, 148b, 150, components of the body support device 70, and the extension arm; and components of the center support 18, may be made of
5 any suitable high strength material, including metal and high strength plastic. The components of the training apparatus 110 are preferably made of aluminum.

The present invention may also take the form of a training apparatus, such as at 210 in Figure 6, that includes two or more of the
10 supports 116. In the apparatus 210, the two supports 116 are attached to opposing sides 212 of the swivel 12. With this arrangement, the apparatus 210 may be used to train two skaters in the same space that is required for using the apparatus 110 to train a single person. It should be recognized that any two skaters grasping the support arms 76 of the apparatus 210 may
15 not contribute equal amounts of energy to propelling the rotational supports 116 about axis A. Thus, the device 210 may best be utilized for teaching proper skating techniques, such as the cross-over skating technique.

It is to be understood that, though the training apparatus of the present invention has been described in the context of skating and skiing,
20 it is equally applicable to other activities where supported movement about an arcuate path would be useful. For example, it is believed that the training apparatus of the present invention would be beneficial for teaching people to walk, such as with the help of a wheeled walker attached to the inventive apparatus; for supporting people who are learning to walk again
25 after debilitating diseases; and for rehabilitating injured persons, such as athletes and accident victims.

Additionally, it is to be understood that a variety of drive, braking, and control mechanisms may be incorporated to supplement the basic features of the inventive apparatus. For example, motors; springs; and

self-perpetuating devices, such as fly wheels, could be connected to drive the rotating support 16 or the rotating support 116. Also, resistance mechanisms could be engaged with the apparatus 10 or the apparatus 110 to enhance the amount of energy needed to revolve the support 16 or the support 116 about
5 axis A. Furthermore, various braking mechanisms could be connected to the apparatus 10 or apparatus 110 to help bring the support 16 or the support 116 to a stop. Finally, various control mechanisms could be incorporated in the components of the apparatus 10 or the apparatus 110 to guide the training or exercise regimen.

10 Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention.

WHAT IS CLAIMED IS:

1. An apparatus for learning a skating technique on a skating surface, the apparatus comprising:
a stationary support disposed along a first axis that intersects the skating surface, the stationary support having a pivot mechanism; and
a first rotatable support capable of being grasped by a skater to support the skater, the first rotatable support having a proximal end, the proximal end attached to the stationary support at the pivot mechanism for rotation of the first rotatable support about the first axis.
2. The apparatus of claim 1 wherein the stationary support comprises a center post that extends along the first axis.
3. The apparatus of claim 1 wherein the rotatable support comprises a boom.
4. The apparatus of claim 1 wherein a length of the rotatable support is adjustable.
5. The apparatus of claim 1 wherein the rotatable support is in movable contact with the skating surface.
6. The apparatus of claim 5 wherein the apparatus further comprises a wheel, the wheel attached to the rotatable support and the wheel in rollable contact with the skating surface.
7. The apparatus of claim 1, and further comprising:

- a guide disposed along a second axis that intersects the skating surface, the guide attached to the rotatable support; and
- a support arm attached to the guide, the support arm selectively rotatable about the second axis, the support arm capable of being grasped by a skater to support the skater.

8. The apparatus of claim 7 wherein the support arm is located above the skating surface and wherein the height of the support arm above the skating surface is adjustable.

9. The apparatus of claim 1, and further comprising a second rotatable support capable of being grasped by a second skater to support the second skater, the second rotatable support having a proximal end, the proximal end of the second rotatable support attached to the pivot mechanism for rotation of the second rotatable support about the first axis.

10. A skate training apparatus usable on a skating surface, the apparatus comprising:

- a center post, the center post approximately perpendicular to the skating surface;
- a boom assembly capable of being grasped by a skater to support the skater, the boom assembly having a proximal end that is rotatably attached to the center post.

11. The apparatus of claim 10, and further comprising:

a support arm rotatably attached to the boom assembly, the support arm capable of being grasped by the skater to support the skater.

12. A method usable by a person wearing skates for practicing a cross-over skating technique on a skating surface, the method comprising:
grasping a rotatable support with the person's hands, the rotatable support attached to a swivel located on a first axis that intersects the skating surface, and the rotatable support capable of rotating about the first axis; and
skating about the first axis on the skating surface along an arcuate route using the crossover technique while grasping the rotatable support and applying a force toward the first axis.
13. The method of claim 12 wherein the person is skating forward along the arcuate route.
14. The method of claim 12 wherein the person is skating backward along the arcuate route.
15. The method of claim 12, and further comprising adjusting a length of the rotatable support to change the arcuate route.
16. The method of claim 12, and further comprising:
attaching a guide to the rotatable support, the guide located on a second axis that intersects the skating surface; and

attaching a support arm to the guide, the support arm selectively rotatable about the second axis.

17. The method of claim 16, and further comprising adjusting a height of the support arm above the skating surface.

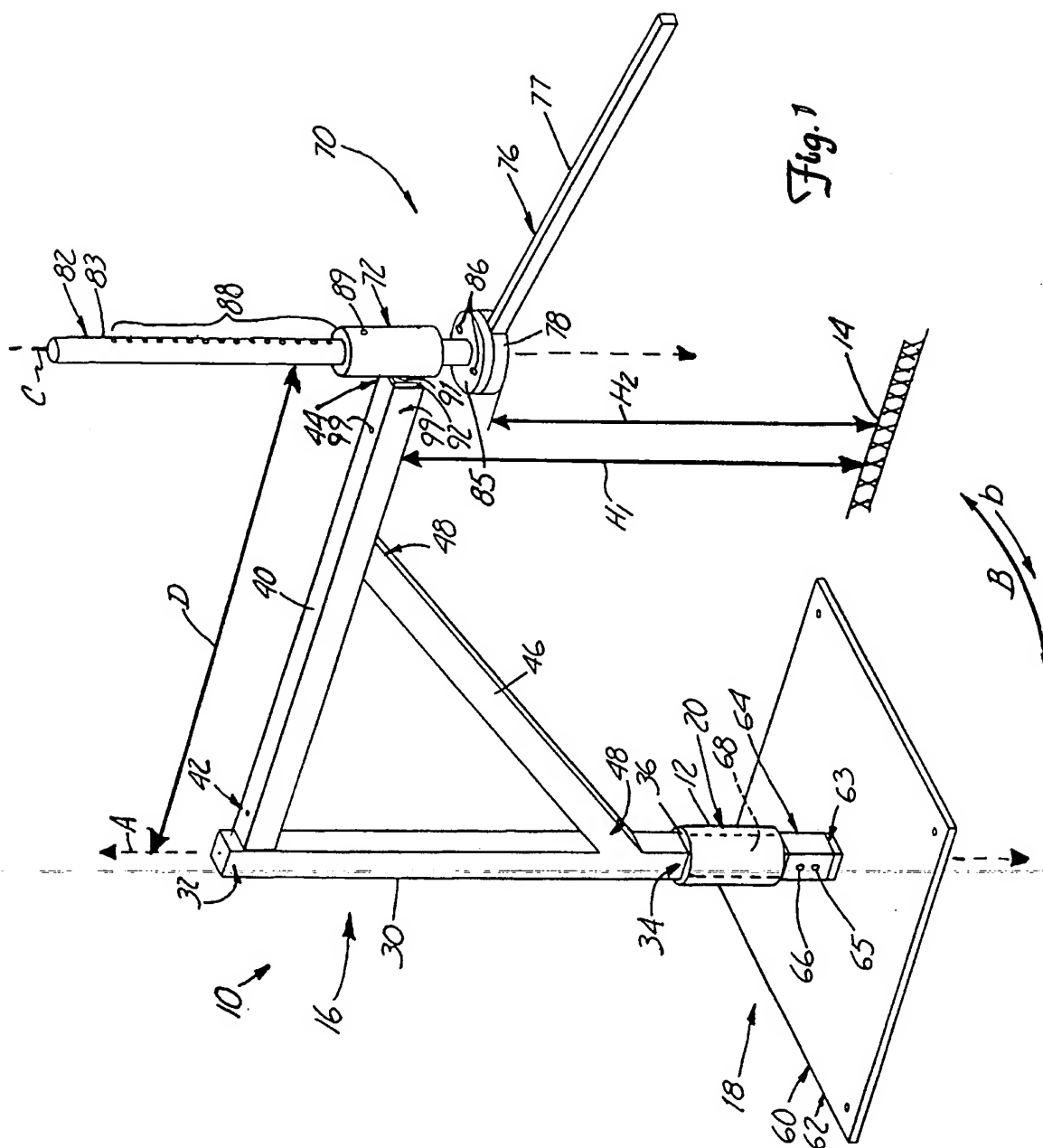
18. The method of claim 12, and further comprising adjusting a height of the rotatable support above the skating surface.

19. A method usable by a person wearing a ski for practicing a skiing technique on a surface, the method comprising:

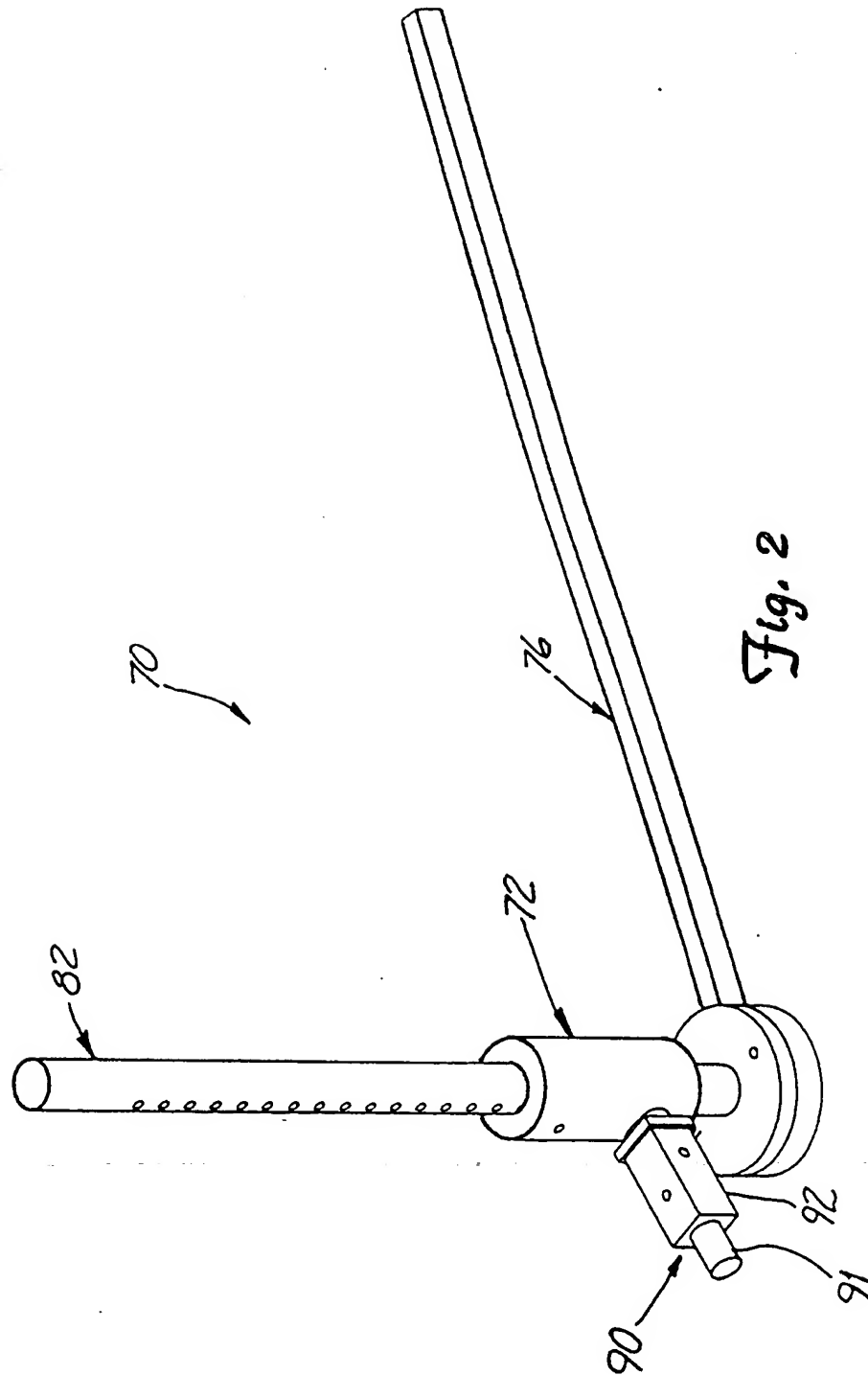
grasping a rotatable support with the person's hands, the rotatable support attached to a pivot mechanism located on a first axis that intersects the surface, and the rotatable support capable of rotating about the first axis; and

skiing about the first axis on the surface along an arcuate route while grasping the rotatable support.

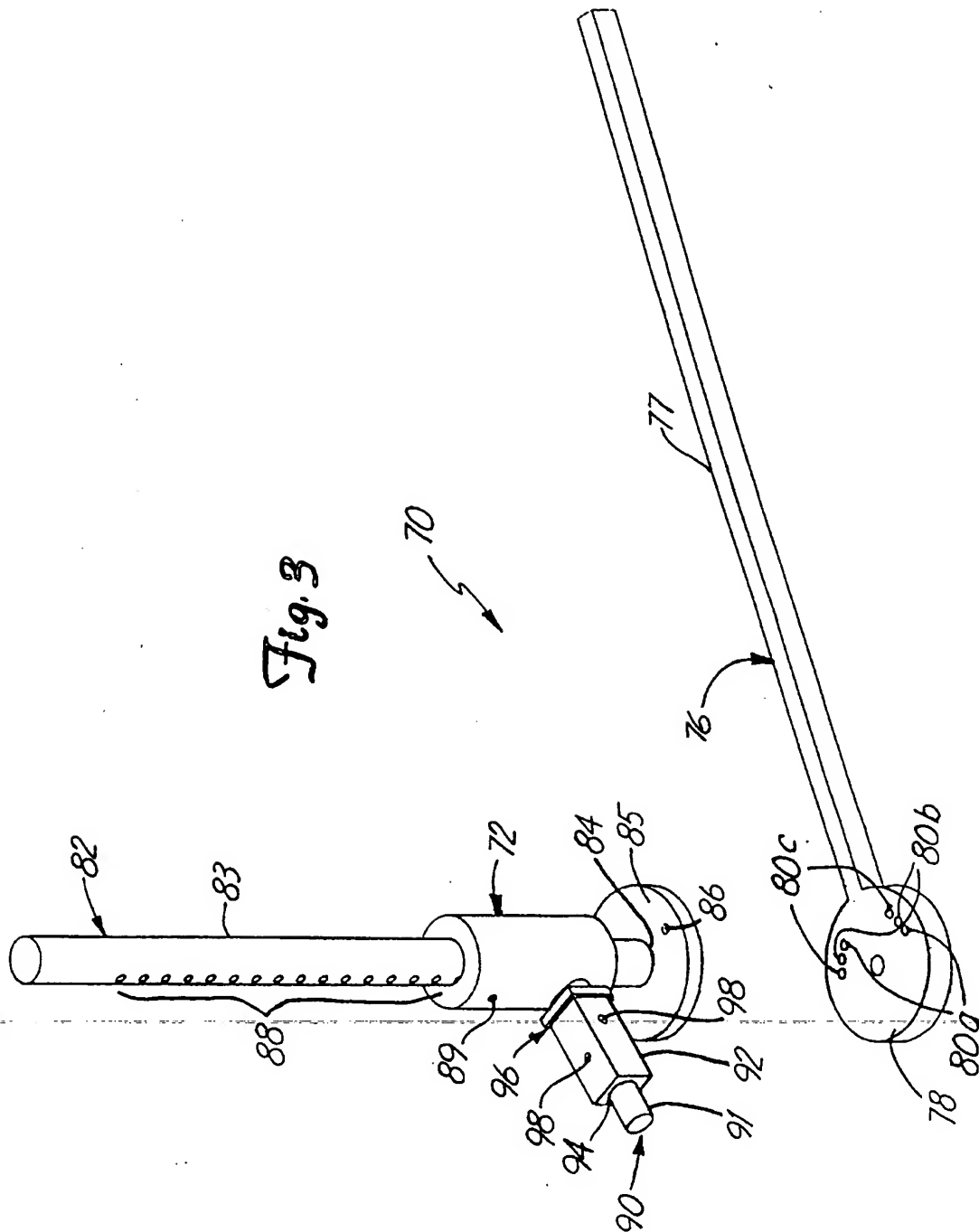
20. The method of claim 19, and further comprising applying a force toward the first axis with the ski.



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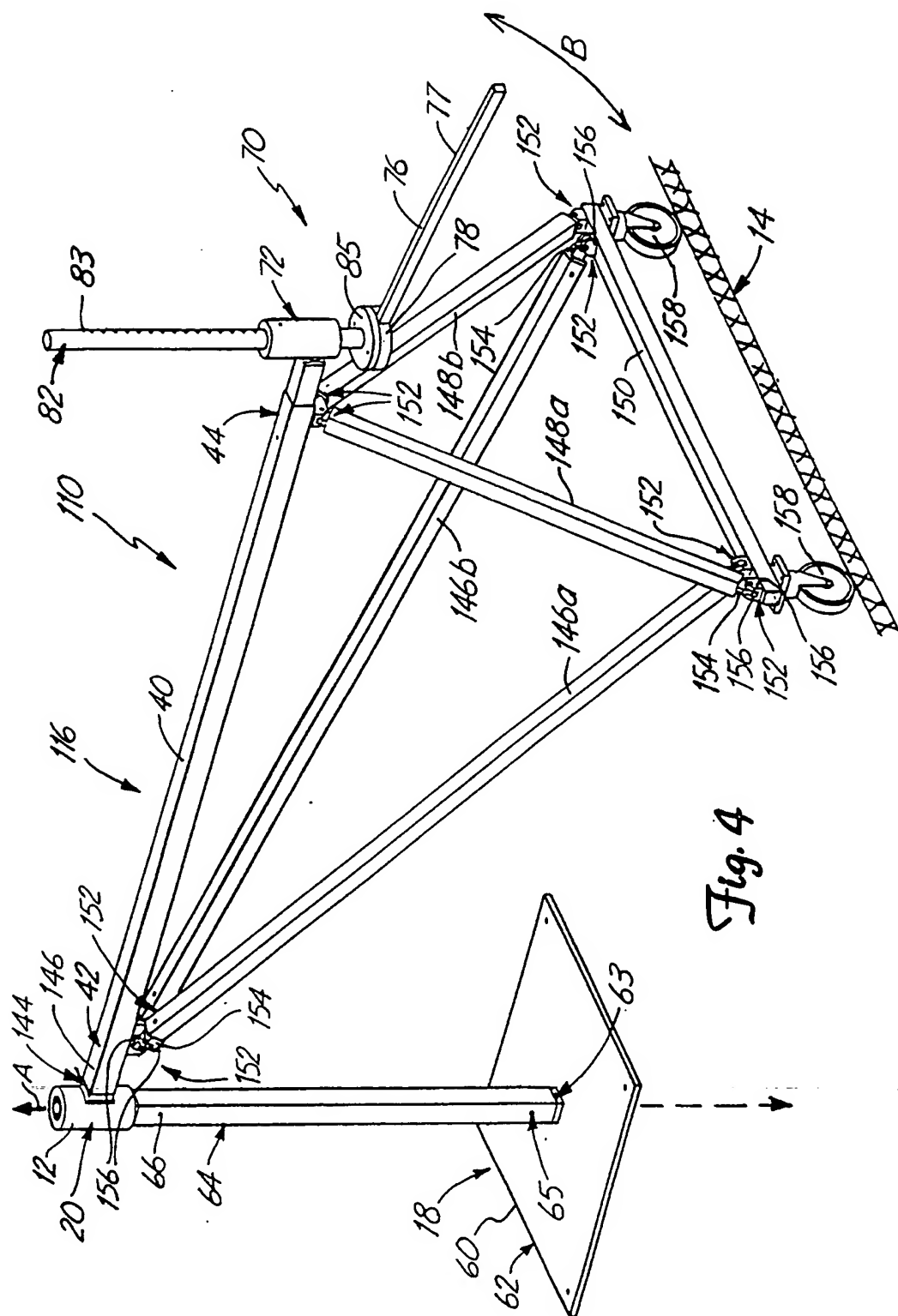
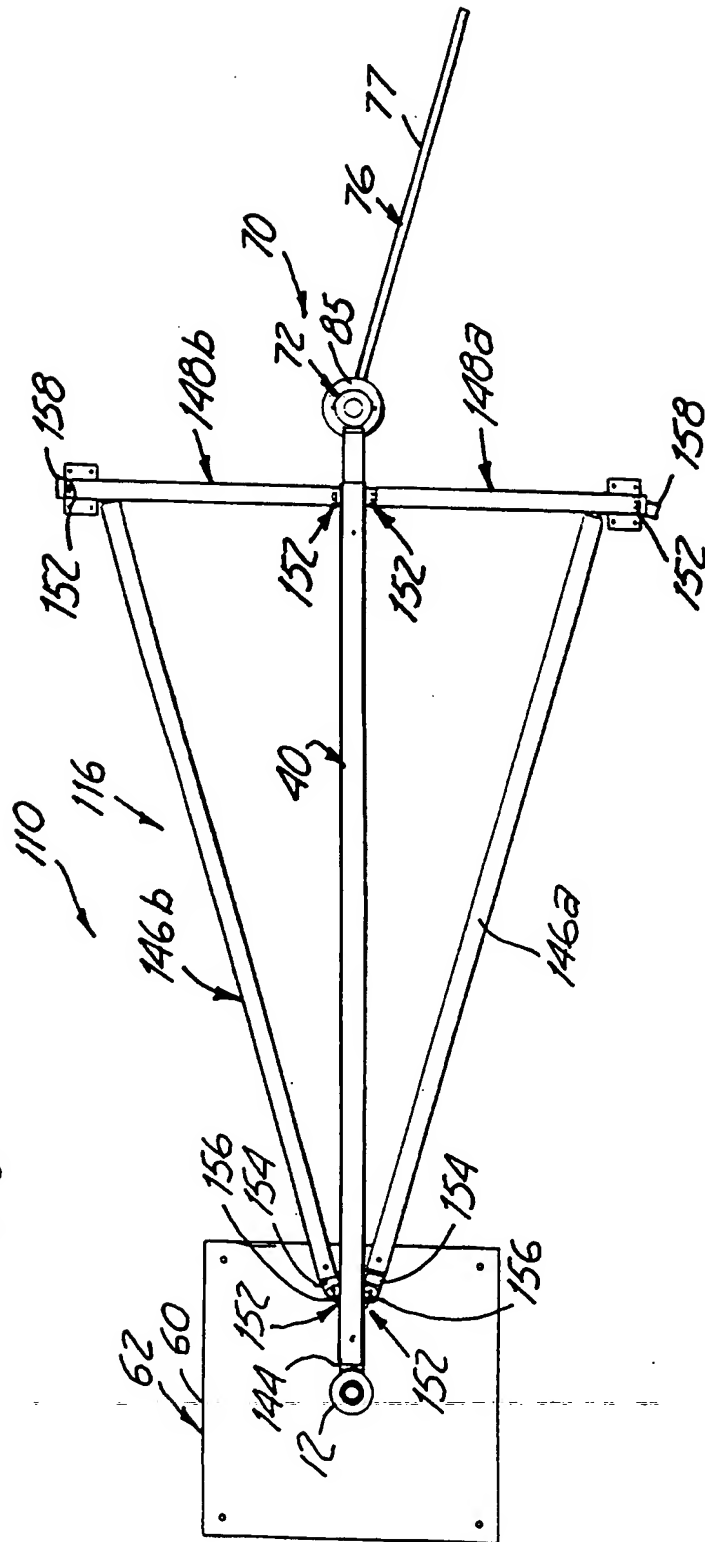


Fig. 4

Fig. 5



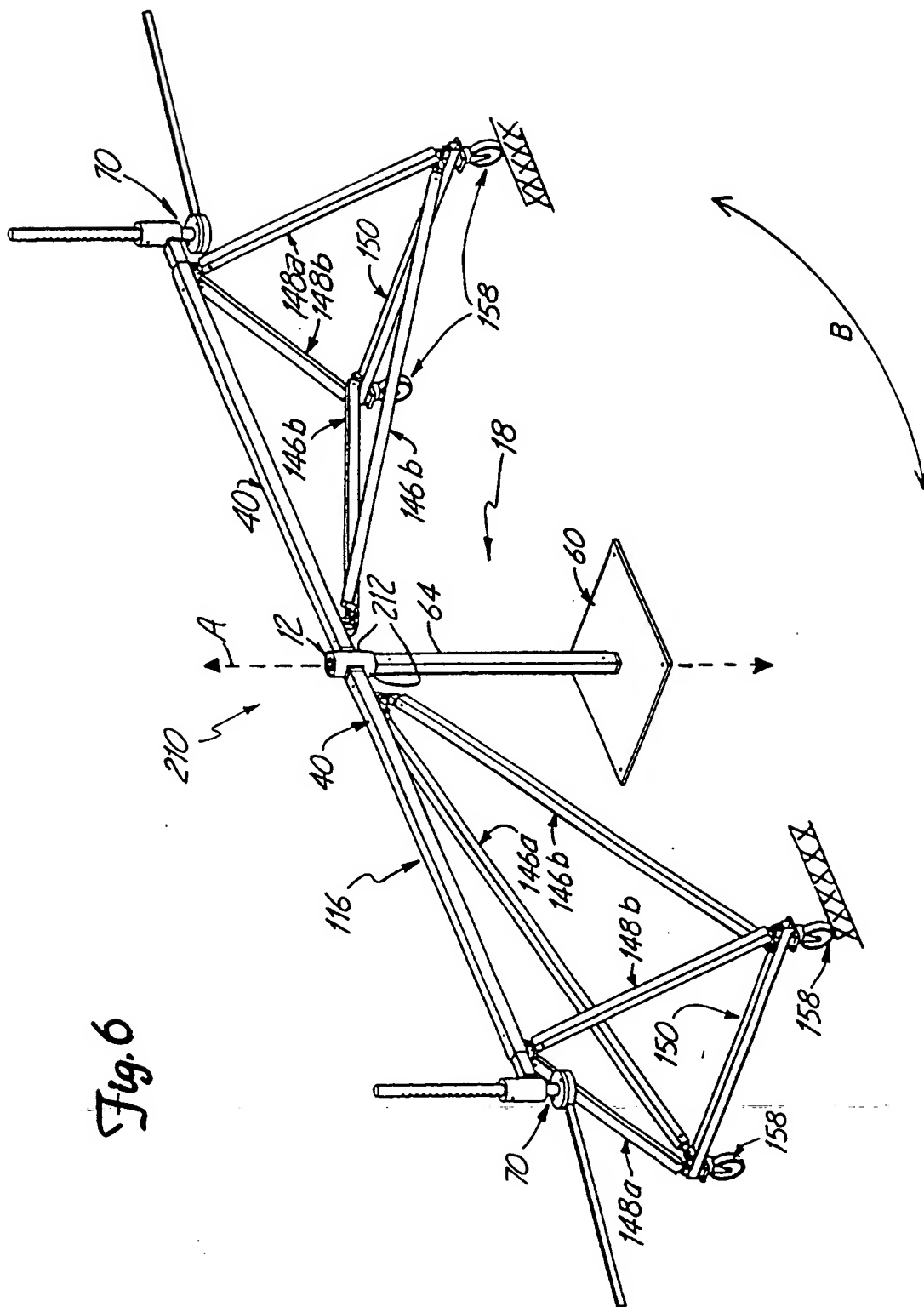


Fig. 6